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Environmental Restoration Project
Standard Operating Procedure

for:

Pressure Transducers

Los Alamos

NATIONAL LABORATORY

Los Alamos, New Mexico 87545

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Revision Log

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Pressure Transducers

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Pressure Transducers

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the process for using pressure transducers at the Los Alamos National Laboratory (Laboratory) ER Project.

2.0 SCOPE

This SOP is a mandatory document and shall be implemented by all ER Project participants when using pressure transducers for the ER Project.

3.0 TRAINING

- 3.1 All users of this SOP are trained by reading the procedure, and the training is documented in accordance with QP-2.2.
- 3.2 The Field Team Leader (FTL) shall monitor the proper implementation of this procedure and ensure that relevant team members have completed all applicable training assignments in accordance with QP-2.2.
- 3.3 The FTL should ensure that field team members understand the use of pressure transducers and the specific data loggers with which they are to be used. The field team members must document that they have read and understand this procedure.

4.0 DEFINITIONS

Note: A glossary of definitions can be located on the ER Project internal homepage <http://erinternal.lanl.gov>.

- 4.1 Hydrostatic head— The pressure exerted by a column of fluid.
- 4.2 Site-Specific Health and Safety Plan (SSHASP)—A health and safety plan that is specific to a site or ER-related field activity that has been approved by an ER health and safety representative. This document contains information specific to the project including scope of work, relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment [PPE]) and hazard mitigation

5.0 BACKGROUND AND PRECAUTIONS

- 5.1 This SOP shall be used in conjunction with an approved SSHASP. Also, consult the SSHASP for information on and use of all PPE.
- 5.2 A pressure transducer measures pressures over a specific range of submergence. Outside this range, measurements will not be accurate. If the transducer is overpressured, permanent damage can occur; therefore, the transducer probe must never be submerged beyond its rated depth.
- 5.3 Most pressure transducers are self-compensating for changes in atmospheric pressure via a vent to the atmosphere. The vent port is normally located where the cable attaches to the data logger. Thus, where extension cables are being used, the operator should ensure that the connector is not submerged. Also, no sharp bends should be made in the transducer cable.
- 5.4 A number of pressure transducers are available on the market and the operator must consult the manufacturer's specifications concerning maintenance and chemical compatibility with contaminants which are expected to be present in the medium to be monitored (usually water).
- 5.5 Under normal conditions it should not be necessary to disassemble the pressure transducer. However, if it does become necessary, follow the manufacturer's instructions carefully and check the accuracy of the reassembled probe as discussed in Section 8.0.

Note: Many data loggers contain lithium batteries, which are classified by the Department of Transportation (DOT) as hazardous material. If shipment is necessary, contact the DOT and all other authorities (i.e., Federal Express, Airport, etc.).

6.0 RESPONSIBLE PERSONNEL

The following personnel are responsible for activities identified in this procedure.

- 6.1 Focus Area Leader
- 6.2 Team Leader
- 6.3 Quality Program Project Leader
- 6.4 Author
- 6.5 ER Project personnel

7.0 EQUIPMENT

A checklist of suggested equipment and supplies needed to implement this procedure is provided in Attachment A. Alphabetized descriptions of commonly used pieces of equipment, their advantages, and their limitations are listed below.

- 7.1 Electric Datalogger—An electronic device that can be programmed to receive electric impulses, that are stored as data. Pressure transducers are designed to be used with automatic data-logging instruments and send a current to the data logger. The current is proportional to the pressure and can be converted to meaningful units by the data logger.
- 7.2 Pressure Transducer — An electronic probe connected to a wire cable that is lowered into the water column of a well to measure pressure. The pressure measured is the total pressure, which includes both the hydrostatic pressure of the fluid column above the transducer and the atmospheric pressure at the fluid surface. Changes in head are proportional to changes in the height of the water column or water-level.

8.0 PROCEDURE

Note: Subcontractors performing work under the ER Project's quality program may follow this SOP for pressure transducers or may use their own procedure(s) provided the substitute meets the requirements prescribed by the ER Project Quality Management Plan, and have been approved by the ER Project's Quality Program Project Leader (QPPL) before starting the activity(s).

Note: ER Project personnel may produce paper copies of this procedure printed from the controlled-document electronic file located at the website http://erinternal.lanl.gov/home_links/Library_proc.htm. However, it is their responsibility to ensure that they are properly trained and are utilizing the current version of this procedure. The author may be contacted if text is unclear.

- 8.1 **Note:** Deviations from SOPs are made in accordance with QP-4.2, Standard Operating Procedure Development, and documented in accordance with QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities.

8.1 Preliminary Activities

Be sure to record the information listed on the manufacturer's data log sheet. Begin by identifying the serial number and model number of the instrument. Record this information on the Daily Activity Log (refer to SOP-01.04).

- 8.1.1 Assemble the equipment and supplies listed in Attachment A. Consult manufacturer's operating manual(s) to ensure the proper operation of all equipment.
- 8.1.2 Ensure the proper operation of the electronic data logger and pressure transducer. Review guidelines in the manufacturer's operating manual for the electronic data logger. Consult the operating manual to learn the proper procedure for setting the transducer's

depth, reference elevation, scale factor, and test number. Be sure that the data logger or its battery pack is fully charged. Use a 3- to 4-ft column of water in a capped piece of polyvinyl chloride [PVC] casing to test the response of the electronic data logger and pressure transducer.

- 8.1.3 Conduct the following tests for the proper depth response and drift of readings in the PVC column. To calibrate the data-logging instrumentation, perform this check daily where possible.

8.1.3.1 Depth-Response Test

1. Mark the length of the transducer cable at measured intervals appropriate for the column of water. With the use of a 4-ft column of water, for example, mark the cable with tape at 1-ft intervals, measuring from the transducer tip.
2. Connect the cable to the data logger and put it into display mode so that changes in hydrostatic pressure can be monitored.
3. Fill a capped piece of PVC well casing with water, submerge the transducer probe to the first mark and obtain a reading. Repeat until the last mark has been reached. Start the logging sequence.
4. Wait one minute and raise the transducer a measured length. Wait one more minute.
5. Continue raising the transducer cable by the measured increments and logging the results, continuing to wait for one minute between measurements, until all segments have been measured.
6. Check the depth recorded on the data logger against the actual depths. If the difference is greater than 5% of the measured depth, return the transducer to the manufacturer for calibration.

8.1.3.2 Drift Test

1. Lower the transducer into the water column and temporarily tape the cable to the edge of the pipe.
2. Connect the transducer cable to the electronic data logger and begin a 15-min. logging sequence.
3. Check the results for noticeable drift of the depth measurement.

4. Notify the manufacturer if an unacceptable noticeable drift is occurring.

8.2 Field Operation of Pressure Transducers

- 8.2.1 Locate the monitoring wells where the pressure transducer will be utilized.
- 8.2.2 Decontaminate the transducer and cable as specified in SOP-01.08.
- 8.2.3 Take an initial water-level measurement from the well to be monitored by using a tape or water-level sounder according to SOP-07.02. Record all pertinent information on the Water- Level Elevation Data Sheet, in SOP-07.02, Attachment B.
- 8.2.4 Before beginning the monitoring, set up the data logger as outlined in the manufacturer's operating manual. The type of information may vary with the model used. Consult the operating manual for the proper data-entry sequence to be used. To prevent accidental data loss, be sure that the field operator understands what computations must be made and how to save the data.
- 8.2.5 Cover sharp edges of the well casing with duct tape to protect the transducer cables. Lower the pressure transducer into place; and monitor the hydrostatic pressure during installation. Duct tape the transducer cable into place before commencing the test.
- 8.2.6 Check the depth of the transducer by using the display mode of the data logger and test transducer response by raising it about a foot.
- 8.2.7 Commence the water-level measuring task to be performed (for example, the slug test or the pumping test).

8.3 Postoperation activities

- 8.3.1 Ensure that all equipment is accounted for and decontaminated (as per SOP-01.08). If decontamination is required, dispose of all decontamination materials according to SOP-01.06.
- 8.3.2 Save and print out data before you shut down the electronic data logger (see the manufacturer's operating manual).

8.4 Lessons Learned

During the performance of work, ER Project personnel shall identify, document and submit lessons learned in accordance with QP-3.2, Lessons Learned. This QP can be located at website:

http://erinternal.lanl.gov/home_links/Library_proc.htm.

9.0 REFERENCES

ER Project personnel may locate the ER Project Quality Management Plan/ER Project QP requirements crosswalk at website:

http://erinternal.lanl.gov/home_links/Library_proc.htm.

The following documents are cited within this procedure.

QP-2.2, Personnel Orientation and Training

QP-3.2, Lessons Learned

QP-4.2, Standard Operating Procedure Development

QP-4.3, Records Management

QP-4.4, Record Transmittal to the Records Processing Facility

QP-5.7, Notebook Documentation

SOP-01.04, Sample Control and Field Documentation

SOP-01.06, Management of Environmental Restoration Project Wastes

SOP-01.08, Field Decontamination of Drilling and Sampling Equipment

SOP-07.02, Water-Level Measurements

10.0 RECORDS

The field team leader is responsible for submitting the following records (processed in accordance with QP-4.4, Record Transmittal to the Records Processing Facility) to the Records Processing Facility.

10.1 Completed Waterlevel Elevation Data Sheet (Attachment B in SOP-07.02).

10.2 Completed Daily Activity Log and/or field notebook to record calibration data, any calculations, decontamination procedures, any deviations, data from the electronic data logger, and any additional comments.

11.0 ATTACHMENTS

The document user may employ documentation formats different from those attached in this SOP—as long as the substituted formats include the information required in the official forms developed by the procedure.

Attachment A: Equipment and Supplies Checklist for Pressure Transducers (1 page) located at <http://erinternal.lanl.gov/Quality/forms.htm>.

[Using a token card, click here to record "self-study" training to this procedure.](#)

If you do not possess a token card or encounter problems, contact the RRES-ECR training specialist.

Equipment and Supplies Checklist for Pressure Transducers

- _____ Electronic data logger and printer or level head
- _____ Manufacturer's operating manual for the data logger in use
- _____ Pressure transducer and cable
- _____ Manufacturer's operating manual for the pressure transducer in use
- _____ Water-level meter
- _____ Tape measure (graduated in tenths of a foot)
- _____ Capped PVC casing
- _____ Duct tape
- _____ Clean water
- _____ Decontamination equipment
- _____ Waterproof pen
- _____ Water-Level Forms
- _____ Daily Activity Logs
- _____ Any PPE listed or required in the SSHASP
- _____ Any additional supplies listed in associated procedures, as needed
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SOP-7.01, R1

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